PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
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Fish Habitat Enhancement Potential And Stocking Assessment Of Burden Lake

A. R. McLean
1991

PWFWCP Report No. 116

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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105-02869/

BURDEN LAKE

WATERSHED: Parsnip River

DATE OF SURVEY: June 24. 25. 1991

FIELD CREW LEADER: A.R. McLean

FIELD ASSISTANT: A.R. Langston

PEACE FISHERIES COMPENSATION PROGRAM

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and

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FISH AND WILDLIFE BRANCH

REPORT PREPARED BY: A.R. McLean

Lake: **BURDEN**

INTRODUCTION

A standard fisheries baseline reconnaissance of Burden Lake was carried out by the Fish and Wildlife Branch (Prince George) in August of 1983. The report, A Reconnaissance Survey of Burden Lake, is on file at the Ministry of Environment, Fish and Wildlife Branch in Prince George.

Burden Lake has been stocked with rainbow trout since 1977 (table 1).

Burden Lake (Plate #1) was investigated in June of 1991 by the Peace Fisheries Compensation Program to identify potential fisheries enhancement projects and to determine if alterations to the current stocking program are necessary.

STOCKING HISTORY

TABLE 1
BURDEN LAKE STOCKING HISTORY

Year	Species	Number	Size (grams)	Stage	Stock
1991	rainbow trout	5,000	5.1	yearling	Premier
1990	rainbow trout	5,000	16.6	yearling	Badger
1989	rainbow trout	5,000	8.1	yearling	Tunkwa
1988	rainbow trout	5,000	11.0	yearling	Tunkwa
1987	rainbow trout	5,000	15.3	yearling	Tunkwa
1986	rainbow trout	5,000	6.3	yearling	Premier
1984	rainbow trout	10,000	6.3	fry	Premier
1982	rainbow trout	5,000	4.0	?	Premier
1980	rainbow trout	10,000	6.3	yearling	Badger
1979	rainbow trout	15,000	3.4	yearling	Premier
1978	rainbow trout	15,000	3.4	?	?
1978	rainbow trout	15,000	2.7	?	?
1977	rainbow trout	15,000	2.25	?	?

LOCATION

Location: 38 km northwest of Mackenzie
Elevation: 747 m +/-
Latitude/Longitude: 55°30'30":123°33'12" U.T.M.:10.4650.61513
Management Unit: 7-29 N.T.S. Map No.: 93-0/12, 0/5 (edition 2)

Drainage: Internal

Plate 1: Panoramic view of Burden Lake looking north from the middle of lake.

Lake: **BURDEN**

METHODS

One sinking monofilament gill net (approx. 15 hour set) and two minnow traps (approx. 22 and 19 hour sets) were set to determine relative abundance and identification of fish species in Burden Lake (See Appendix 1 for net set details) (See figure 1 for net set locations).

Rainbow trout were sampled for length, weight, sex, maturity, stomach contents and parasite/disease presence (Appendix 2). Scale samples were collected for age determination. General appearance of the rainbow trout was recorded through visual analysis. The total catch and size range of coarse fish captured during the investigation was also recorded.

The fisheries enhancement potential of any inlets or outlets was determined through visual observation and recording of physical data, using standard methodologies outlined in the Fish/Habitat Inventory and Information Program (1987 Stream Survey Field Guide).

On site anglers were interviewed opportunistically. Salmonid catch per unit effort information was recorded from these anglers and angling undertaken by program staff.

The benchmark set during the initial study (1983) was located (figure 1). Any change in water level was measured using an eslon tape, in combination with a abney level.

Photo documentation of the investigation was also completed (see figure 1 for photo locations).

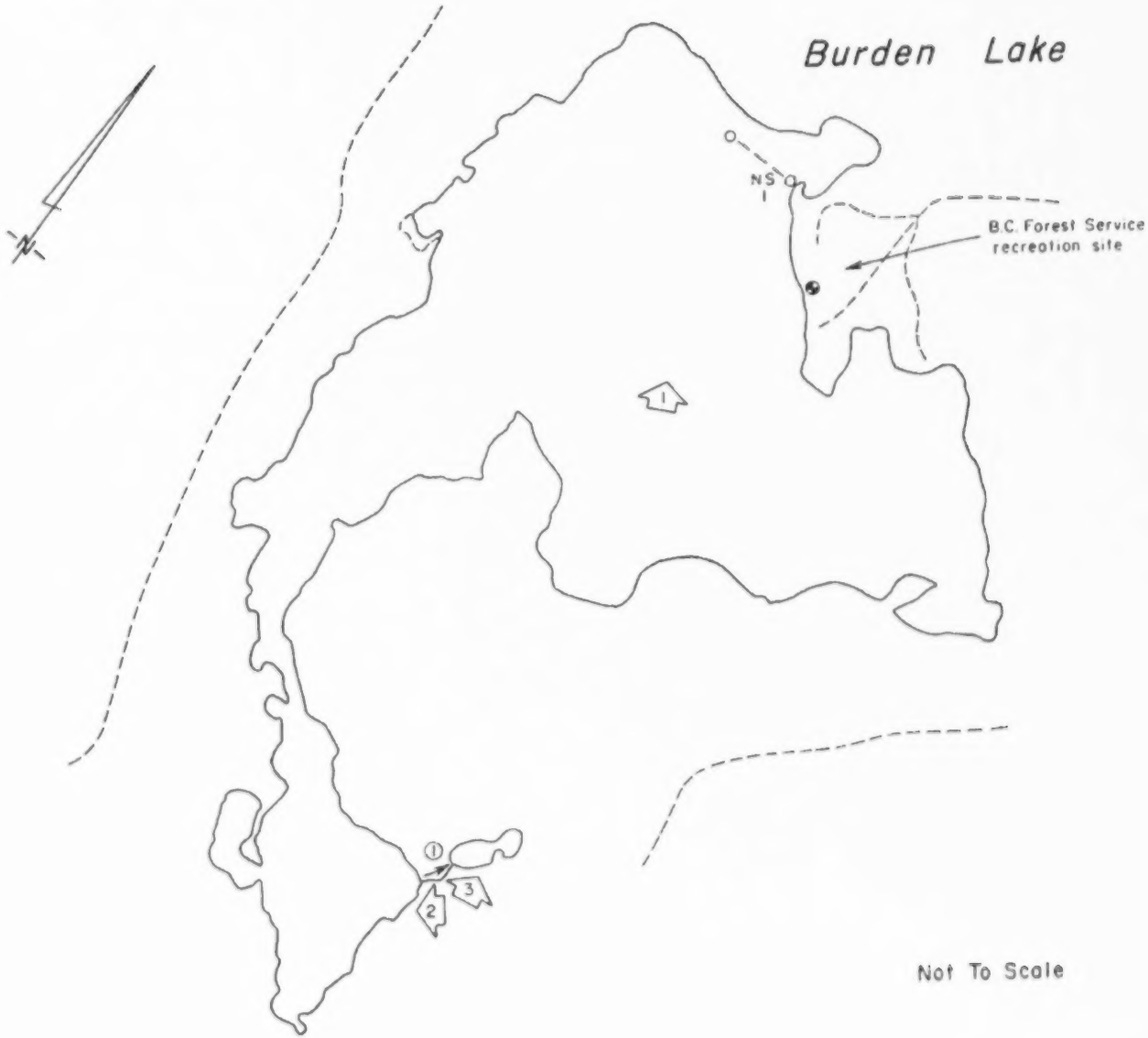
Burden Lake
N
NS
B.C. Forest Service
recreation site
1
1
2
3
Not To Scale

Figure 1

Lake: **BURDEN**

RESULTS & DISCUSSIONS

One overnight net set produced 25 rainbow trout, 113 longnose suckers and 3 lake chub (table 2). Two minnow traps yielded 14 longnose suckers and 174 lake chub (table 3). Average fork length, weight and condition factor was calculated on the 25 rainbow trout captured in the overnight net set and 5 angled rainbow trout (table 4).

TABLE 2
LAKE CATCH SUMMARY

Species	Net Site Number				Angled	Other	Total	Number Sampled	Number Preserved	Size Ran (cm)
	1	2	3	4						
rainbow trout	25	-	-	-	5		30	30	-	27.8 - 49
longnose sucker	113	-	-	-	-	-	113	-	-	12.5 - 33
lake chub	3	-	-	-	-	-	3	-	-	10.8

TABLE 3
MINNOW TRAP CATCH

#	Hours	Depth (m)	Substrate	Specie	Size Range (cm)
1	22.30	1.0	gravel/fines	49 lake chub 6 longnose sucker	4.7 - 8.2 5.3 - 15.7
2	19.25	0.8	gravel/fines/organics	125 lake chub 8 longnose sucker	5.5 - 7.6 5.5 - 8.8

Bait: Sardines

Lake: **BURDEN**

TABLE 4
AVERAGE LENGTH, WEIGHT AND CONDITION FACTOR

Rainbow trout	Fork Length (cm)	Weight (grams)	Condition Factor
Number	30	30	30
Mean	34.6	500.6	1.15
Std	4.3	220.2	0.10
Min	27.8	260	0.85
Max	49.6	1250	1.36
		Condition Factor Formula: k=(W(grms)x100)/L(cms)3	

Length vs Age

An indication of growth rate is provided through the length/age relationship of the 30 rainbow trout sampled (table 5, figure 2).

TABLE 5
LENGTH/AGE RELATIONSHIP

Species	Age	Sample Size	Mean (cm)	Std Dev.	Min(cm)	Max(cm)
rainbow trout	2	5	30.5	2.0	27.8	30.5
rainbow trout	3	12	33.9	2.3	28.2	36.8
rainbow trout	4	8	34.6	1.9	31.7	37.4
rainbow trout	5	2	38.0	2.0	36.0	40
rainbow trout	6	2	47.1	2.6	44.5	49.6

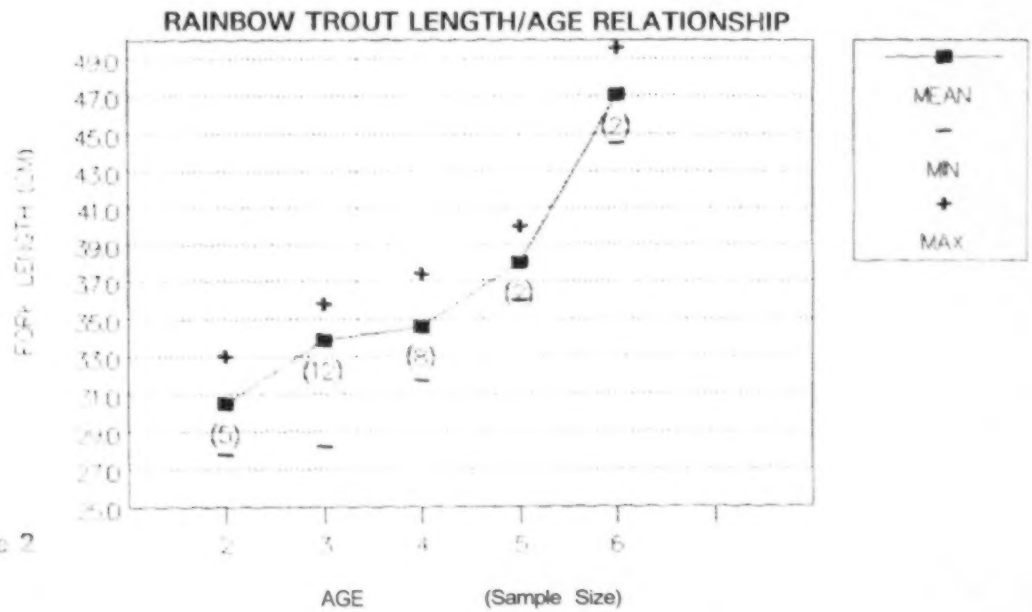

figure 2

Lake: **BURDEN**

Length vs Weight

The proportionate upward trend in the length/weight relationship of the rainbow trout is shown in figure 3.

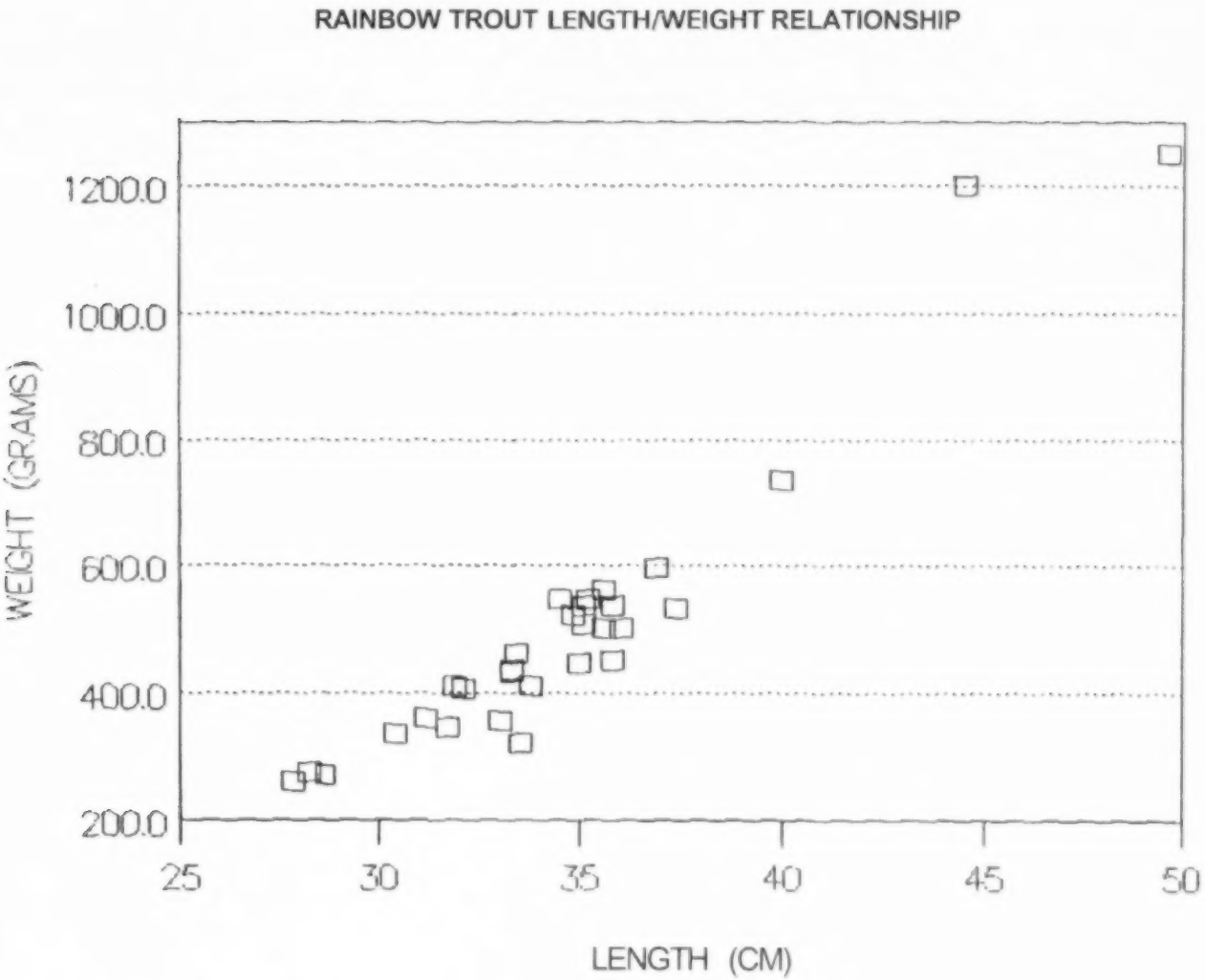

figure 3

Lake: **BURDEN**

BIOLOGICAL ANALYSIS OF RAINBOW TROUT

Biological analysis was conducted on 28 of the rainbow trout. The rainbow trout consisted of 14 females and 14 males. Reproductive organ analysis indicated 25 of rainbow trout were gravid, 1 was maturing, and 2 were immature. Stomach content examination revealed a diet primarily consisting of beetles, with shrimp, detritus and trout eggs also noted. Fish were noted in 3 of the examined stomachs. The rainbow trout appeared generally healthy despite the spawnbound condition. Tapeworms were observed in 3 stomachs and tapeworm cysts were observed on the external surface of 1 of the examined stomachs.

DRAINAGE

Unnamed C. - outlet

The short outlet creek flows from the south southeast end of the lake to a sinkhole pond (Plate #2). A beaver dam (1.8 m in height)(Plate #3) which controls the current lake level is located at the head of the outlet. The dam effectively impedes all upstream fish passage. Approximately 50 m downstream from the lake, the creek had a wetted width of 1.0 m, average depth of 0.14 m, and a gradient of 0.3%. Marginal salmonid spawning habitat and good salmonid rearing habitat was noted.

Plate #2: View of sinkhole pond located at end of outlet.

Plate #3:
View upstream at beaver dam (1.8 m in height) at head of outlet. The dam controls current lake level and is a barrier to upstream fish passage.

Lake: **BURDEN**

ANGLER USE AND USE AND CATCH PER UNIT EFFORT

Creel information was gathered from 2 parties and our own angling efforts (2 people). Angling catch per unit effort was measured at 1 rainbow trout per hour.

BENCHMARK

The original benchmark set in 1983 was located. It was originally set 2.0 m above the water level. The benchmark is now 2.03 m above the current water level. A 3 cm drop in lake level is apparent.

Due to vandalism, the benchmark was transferred to a spruce tree 2.0 m north of the original benchmark site. The benchmark was reset 2.03 m above current water level, in a 28 cm diameter spruce tree. The benchmark is located 7.8 m from water's edge, approximately 30 m north of the main boat launch.

MISCELLANEOUS COMMENTS

Two anglers indicated that they would like to see the wharf that was once located at the Recreation Site replaced.

Unidentified coarse fish species were observed in the outlet creek and sinkhole pond.

RESORTS AND CAMPSITES

The recreation site (B.C. Forest Service) at the lake's edge is classified as a high use site with 1,189 user days in 1990 (Pers Comm., J. Ladds, B.C. Forest Service). The site is complete with fire pits, outhouses and picnic tables.

Lake: **BURDEN**

FISHERIES MANAGEMENT COMMENTS

Burden Lake supports a population of rainbow trout (stocked), longnose sucker and lake chub. The rainbow trout captured during the investigation have a healthy appearance and appear to be in good condition (C.F. 1.15 (0.85-1.36)). However, limited growth between the 3 and 4 year old rainbow is apparent. Stomach content analysis revealed a diet (primarily) of beetles. Fish were noted in 3 of the examined stomachs. As a result of no available spawning habitat, the rainbow trout are spawnbound. However, this factor does not appear to seriously impact the fishery as the catch per unit effort during the investigation (June) was measured at 1.0 rainbow trout per hour. The lake level is controlled by a beaver dam (1.8 m in height) located at the lake outlet. The short outlet creek affords no fisheries potential as the beaver dam effectively impedes all upstream fish movement. A total of 5,000 rainbow trout were stocked into Burden Lake in 1991.

Stocking Program

The current stocking program appears to be successful, however thorough recommendations with regard to this cannot be made until total angler use and C.P.U.E. is assessed. Stocking Burden Lake with the same density, frequency and strain of fish until 1995 is recommended. This will significantly improve future stocking program evaluation recommendations. A stocking program evaluation is recommended in 1995. The feasibility of stocking All-Female Pennask rainbow trout and/or brook trout should be investigated.

Enhancement Potential

No physical enhancements are recommended. Removal of the beaver dam at the lake outlet would flood the outlet creek and the sinkhole pond to the same water level as the lake (no gains would be made).

Lake: BURDEN

APPENDIX 1

Lake: **BURDEN**

NETTING RECORD

Number of panels: 6
Individual panel length: 15.2m
Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #1

Type:	Sinking monofilament		
Date Set:	June 24, 1991	Time:	1916 hrs
Date Lifted:	June 25, 1991	Time:	1030 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth:	1.5 m
		Substrate:	organics
Deep End Mesh Size:	64 mm	Depth:	9.5 m
		Substrate:	organics

Lake: BURDEN

APPENDIX 2

Lake: **BURDEN**

INDIVIDUAL FISH DATA

Date Captured: June 25, 1991

Method of Capture: angled

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
FR - Fin Ray
HD - Head
ML - Milt
OT - Otolith

SC - Scale
ST - Stomach
TG - Fish Tag
WF - Whole Fish

Species	Fork Lgth (cm)	Wght (g)	Sex	Gonadal maturity	Sample Type	Age y.	Stomach Contents				Comments
							Plankton	Insects	Fish	Other	
rainbow trout	27.8	260	M	IMM	SC	2+				empty	angled
rainbow trout	28.2	275	M	GV	SC	3		beetles			
rainbow trout	28.6	270	-	-	SC	2+					angled
rainbow trout	30.4	335	M	GV	SC	3		beetles			
rainbow trout	31.2	360	F	MG	SC	2+		beetles			tapeworm cysts on stomach, angled
rainbow trout	31.7	345	M	GV	SC	4		dragon fly nymphs unidentified insects			
rainbow trout	31.9	410	F	GV	SC	2+		larvae beetles			resorbing eggs
rainbow trout	32.1	405	M	GV	SC	4		beetles			
rainbow trout	33.0	355	F	GV	SC	2				empty	angled
rainbow trout	33.3	430	F	GV	SC	3		beetles			
rainbow trout	33.3	435	M	IMM	SC	3+		beetles			
rainbow trout	33.4	460	F	GV	SC	3		beetles		tapeworms	
rainbow trout	33.5	320	M	GV	SC	4		2 dragon flies			
rainbow trout	33.8	410	M	GV	SC	-		beetles		3 trout eggs	
rainbow trout	34.5	545	F	GV	SC	4				unidentified material	
rainbow trout	34.8	520	F	GV	SC	3		beetles		detritus	
rainbow trout	35.0	445	F	GV	SC	3		beetles			
rainbow trout	35.1	505	F	GV	SC	4				shrimp	
rainbow trout	35.1	535	F	GV	SC	3		beetles		tapeworm	
rainbow trout	35.2	545	M	GV	SC	4		beetles			
rainbow trout	35.6	560	F	GV	SC	3+					resorbing eggs
rainbow trout	35.6	500	M	-	SC	3+					angled
rainbow trout	35.8	535	F	GV	SC	3		beetles			
rainbow trout	35.8	450	M	GV	SC	3		beetles			
rainbow trout	36.0	500	M	GV	SC	5		beetles			
rainbow trout	36.9	595	F	GV	SC	4		beetles			
rainbow trout	37.4	530	F	GV	SC	4+		beetles			
rainbow trout	40.0	745	M	GV	SC	5			2 unidentified		
rainbow trout	44.5	1,200	M	GV	SC	6			3 unidentified	tapeworms	
rainbow trout	49.6	1,250	M	GV	SC	6			1 sucker 2 unidentified		

AGE DETERMINATION COMPLETED BY:
Margaret MacDonald, Box 243, Midway, B.C.

AGE DETERMINATION VERIFIED BY:
Arne Langston, Peace Fisheries Compensation Program, Prince George, B.C.